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United States Department of Agriculture.

BUREAU OF FORESTRY.—Circular No. 29.

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EXHIBIT OF TREE PLANTING ON A MODEL PRAIRIE FARM AT THE LOUISIANA PURCHASE EXPOSITION.

THE FARM.

The model farm forms part of the open-air exhibit of the Bureau of Forestry at the Louisiana Purchase Exposition, and is designed to illustrate the use of forest trees for windbreaks, hedges, and woodlots in the Prairie States. It comprises a tract 264 feet square, laid off to represent a southeast quarter section reduced on a scale of one-tenth the actual linear measurements. The model shows, therefore, a practicable arrangement of fields, farmstead, and forest plantations on a prairie farm of 160 acres, all of which is tillable. The relative location and extent of woodlot, hedges, and windbreaks have been carefully planned with reference to actual needs and conditions. The field crops are arranged in accordance with a plan of rotation suitable to the Middle West, the details of which are explained in a circular issued by the Bureau of Plant Industry.

HEDGES AND FIELD BOUNDARIES.

In accordance with the common practice of the Prairie States, the public roads run on the section lines. They represent a width of 4 rods. Lines of shade trees planted at 4-foot intervals, corresponding to 40 feet of actual distance, stand in the edge of the public highway. The farm is bordered on all four sides by hedges of Osage orange—a tree which, in spite of the considerable prejudice against its use in many parts of the Middle West, has such advantages for windbreaks and other protection as far to outweigh the objections brought against it.

The farmstead, providing for the location of the house, barns, yards, orchard, garden, etc., occupies the southeast corner of the farm, and is separated by hedges of Osage orange from the adjoining fields on the west and north. The north and south hedge is prolonged to the northern boundary of the farm, setting off field A, north of the farmstead, from fields B, C, D, E, and F, which run east and west in equal strips across the remainder of the farm and are separated from each other by single lines of trees. The entire quarter section is thus divided into six rectangular fields, all of the same dimensions and each containing 22.1 acres, and a square farmstead containing 5.9 acres. Private lanes on the north and west sides of the farmstead connecting with the public roads give access to all the fields of the farm. The single lines of trees consist of such species as are hardy in exposed situations. Along the north boundary, inside the hedge, is a row of Austrian pine, which will serve as a windbreak in winter. The trees in the edge of the highway along the east hedge line are white elm, while those along the south are pecan. One side of each private lane has been planted with a row of honey locust. The boundary lines separating fields B, C, D, E, and F are planted with black walnut, hackberry, Carolina poplar, and sycamore. The purpose of the single rows of trees separating the fields is to afford living fence posts upon which to fasten woven-wire fencing, and to protect the fields against the hot southwest winds. The figure on the opposite page shows how the model farm is laid out. The forest plantations contiguous to the model farm on the north and south, numbered 1 to 48, illustrate woodlot plantations suited to different sections of the United States, and are described in another circular.

WINDBREAKS.

Windbreaks are provided, in addition to the single rows of trees running east and west between the fields, by strips of forest plantations on the south and west sides of the farm, a strip on the west side of field A and the farmstead, and a short strip on the north of the farmstead, which is thus protected on three sides. The location and extent of these plantations have been carefully planned with reference to the protection which they will give. The distance to which the beneficial effects of a windbreak are felt depends on its height and density. With the arrangement proposed all parts of the farm will be shielded against the southwest hot winds of summer, while adequate protection is also secured for both stock and household against the discomforts of the fierce winter "northers."

Without making any allowance for the space occupied by the single rows of trees located on the boundaries of the fields, the forest plantations serving for windbreaks here provided for would occupy 17.7 acres on a quarter section.

The windbreaks are 8 feet 2 inches wide, from the hedgerow to the last row of trees next to the inclosed field. This corresponds to a width of about 5 rods on the real farm. For convenience in cultivation and in order to insure good growth during the Exposition, the trees in the windbreaks have been planted 18 inches apart in rows in two directions, instead of one-tenth the actual intervals advisable on a farm. This distance is one-third to one-fourth what the distance should be in actual practice (4½ to 6 feet apart each way). The width

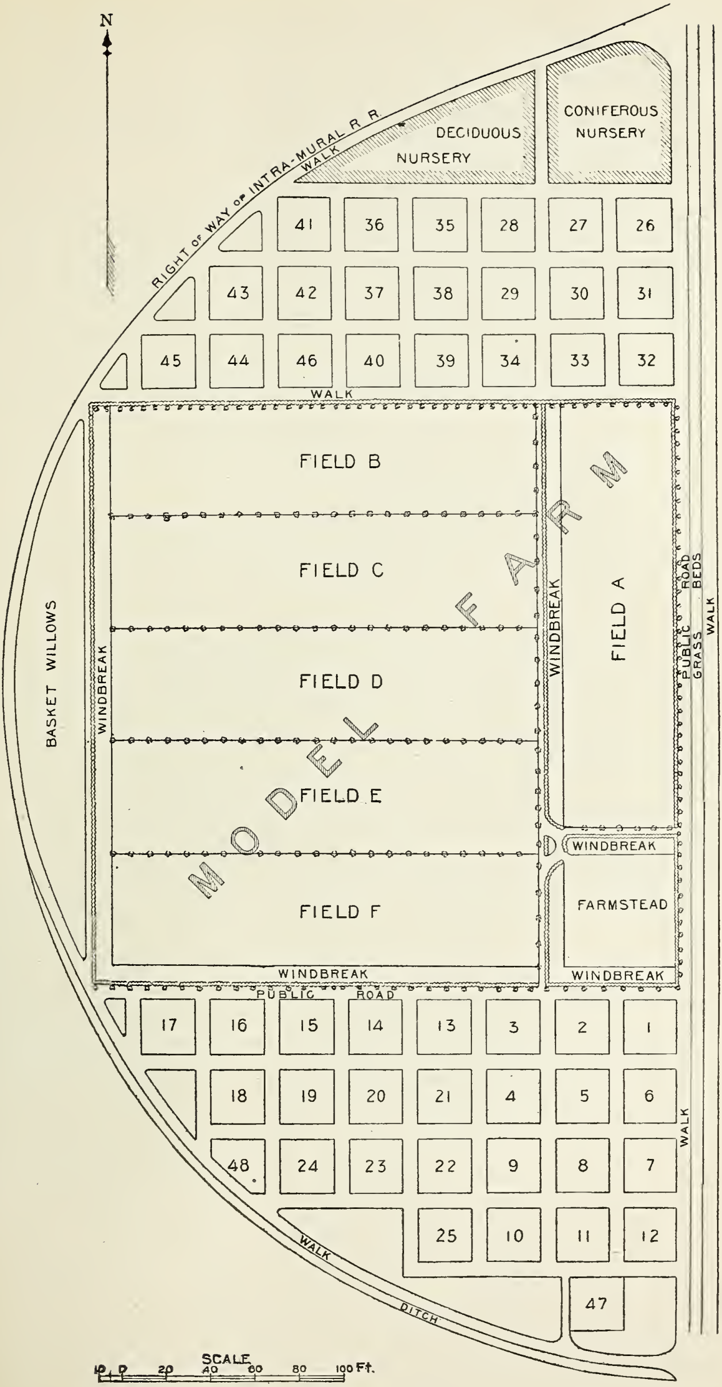

FIG. 1.—Plan of the forest planting exhibit Bureau of Forestry.

of 5 rods on the real farm, besides making forest conditions possible within the plantations, is sufficient to provide a home supply of fuel and timber, while the location of the belts at the sides and ends of the fields does not interfere with the tillage of the land. A space of 9 feet 8 inches is allowed between each timber belt and the adjacent hedge, for convenient access and cultivation.

Each windbreak and section of a windbreak on the model farm at the Exposition represents a mixture suitable to a definite region, but this should not be taken to be the only mixture adapted to the region. The number of available species and useful combinations far exceed the possibilities of illustration in the allotted space, and many which are not shown at all might have been used just as well as those chosen.

The windbreak at the north side of the farmstead on the model farm (fig. 1) is planted with a mixture suitable to the prairies of Wisconsin, Minnesota, and Iowa, consisting of alternating rows of Austrian pine and Norway spruce.

The following table shows the required number of rows and trees on a windbreak belt 5 rods wide and 1 acre in area as it would appear in actual practice:

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.
If planted 6 feet apart each way:		
Austrian pine	7	652
Norway spruce	6	558
Total	13	1,210
If planted 4½ feet apart each way:		
Austrian pine	9	1,138
Norway spruce	8	1,012
Total	17	2,150

On the west side of the farmstead (fig. 1), illustrating a mixture suitable for the New England and the Great Lake States, are planted alternating rows of European larch and white pine, arranged in accordance with the following diagram:

Diagram No. 1.

EL EL EL EL EL EL

WP WP WP WP WP WP

EL EL EL EL EL EL

WP WP WP WP WP WP

EL=European larch (*Larix europæa*); WP=White pine (*Pinus strobus*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
European larch	7	652	European larch	9	1,138
White pine	6	558	White pine	8	1,012
Total	13	1,210	Total	17	2,150

The entire windbreak belt west of field A (fig. 1) is planted with a mixture suitable to the arid plains of western Kansas, eastern Colorado, western Oklahoma, northwestern Texas, and eastern New Mexico, consisting of green ash, Russian mulberry, black locust, and white elm, arranged in accordance with the following diagram:

Diagram No. 2.

A M A M A M

L E L E L E

A M A M A M

L E L E L E

A=Green ash (*Fraxinus lanceolata*); M=Russian mulberry (*Morus alba tatarica*); L=Black locust (*Robinia pseudacacia*); E=White elm (*Ulmus americana*).

Required number of rows and trees of each species per acre for this windbreak.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Green ash	7	326	Green ash	9	569
Russian mulberry		326	Russian mulberry		569
Black locust	6	279	Black locust	8	506
White elm		279	White elm		506
Total	13	1,210	Total	17	2,150

To illustrate a plantation suitable for the Middle Western States east of the Mississippi, a section 58 feet 8 inches long of the south windbreak immediately south of the farmstead is planted with a mixture of black walnut and sugar maple in equal proportions, in accordance with the following diagram:

Diagram No. 3.

W SM W SM W SM

SM W SM W SM W

W SM W SM W SM

W=Black walnut (*Juglans nigra*); SM=Sugar maple (*Acer saccharum*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Sugar maple	13	605	Sugar maple	17	1,075
Black walnut		605	Black walnut		1,075
Total		1,210	Total		2,150

The belt south of field F is planted with a mixture suitable for the high prairies of western Kansas and western Nebraska, consisting of rows of green ash, hackberry, and honey locust, arranged thus:

Diagram No. 4.

A A A A A A

H H H H H H

HL HL HL HL HL HL

A=Green ash (*Fraxinus lanceolata*); HL=Honey locust (*Gleditsia triacanthos*); H=Hackberry (*Celtis occidentalis*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Green ash	5	466	Green ash	6	759
Hackberry	4	372	Hackberry	6	759
Honey locust	4	372	Honey locust	5	632
Total	13	1,210	Total	17	2,150

The section of windbreak west of field F, 50 feet 6 inches long, is planted with a mixture suitable for the hot upland prairies of southwestern Kansas, Oklahoma, and Texas, consisting of alternating rows of red cedar and *Biota orientalis* arranged in accordance with the following diagram:

Diagram No. 5.

Ba Ba Ba Ba Ba Ba

J J J J J J

Ba Ba Ba Ba Ba Ba

J J J J J J

Ba=Biota (*Biota orientalis*); J=Red cedar (*Juniperus virginiana*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Biota orientalis	7	652	Biota orientalis	9	1,138
Red cedar	6	558	Red cedar	8	1,012
Total	13	1,210	Total	17	2,150

The section of windbreak west of field E, 50 feet 6 inches long, is planted with a mixture suitable to the arid upland prairies of western Nebraska and the western two-thirds of the Dakotas, consisting of rows of Russian wild olive, western yellow pine, and green ash, arranged in accordance with the following diagram:

Diagram No. 6.

A A A A A A

El El El El El El

YP YP YP YP YP YP

A=Green ash (*Fraxinus lanceolata*); El=Russian wild olive (*Elæagnus angustifolia*); YP=Western yellow pine (*Pinus ponderosa*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Green ash	5	466	Green ash	6	759
Russian wild olive	4	372	Russian wild olive	6	759
Western yellow pine	4	372	Western yellow pine	5	632
Total	13	1,210	Total	17	2,150

The section of the windbreak west of field D, 50 feet 6 inches long, is planted with a mixture suitable to the river bottoms of southern Missouri, Arkansas, Kentucky, and Tennessee, consisting of equal parts of yellow cottonwood and sweet gum, arranged in accordance with the following diagram:

Diagram No. 7.

SG YC SG YC SG YC

YC SG YC SG YC SG

SG YC SG YC SG YC

SG=Sweet gum (*Liquidambar styraciflua*); YC=Yellow cottonwood (*Populus deltoides*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Sweet gum	13	605	Sweet gum	17	1,075
Yellow cottonwood		605	Yellow cottonwood		1,075
Total	....	1,210	Total	....	2,150

The section of windbreak west of field C, 50 feet 6 inches long, is planted with a mixture suitable to the Red River Valley of the North, eastern South Dakota, and western Minnesota, consisting of equal parts of jack pine and white spruce arranged in accordance with the following diagram:

Diagram No. 8.

JP S JP S JP S

S JP S JP S JP

JP S JP S JP S

JP=Jack pine (*Pinus divaricata*); S=White spruce (*Picea canadensis*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Jack pine	13	605	Jack pine	17	1,075
White spruce		605	White spruce		1,075
Total	....	1,210	Total	....	2,150

The section of windbreak west of field B, 50 feet 6 inches long, is planted with a mixture suitable to the orange-growing districts of southern California, consisting of equal parts of blue gum and Monterey cypress, arranged in accordance with the following diagram:

Diagram No. 9.

BG MC BG MC BG MC

MC BG MC BG MC BG

BG MC BG MC BG MC

BG=Blue gum (*Eucalyptus globulus*); MC=Monterey cypress (*Cupressus macrocarpa*).

Required number of rows and trees of each species per acre.

Species.	Rows.	Trees.	Species.	Rows.	Trees.
If planted 6 feet apart each way:			If planted 4½ feet apart each way:		
Blue gum	13	605	Blue gum	17	1,075
Monterey cypress		605	Monterey cypress		1,075
Total	....	1,210	Total	....	2,150

Approved:
JAMES WILSON, *Secretary.*

WASHINGTON, D. C., *April 30, 1904.*

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